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FINAL REPORT

NORTH STAR MINE
POWDER RIVER COUNTY, MONTANA

OCTOBER, 1985

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FINAL REPORT

NORTH STAR MINE
POWDER RIVER COUNTY, MONTANA

OCTOBER, 1985

ATTENTION: MR. RICHARD JUNTUNEN, CHIEF
Abandoned Mine Reclamation Bureau
Department of State Lands
1625 11th Avenue
Helena, Montana 59620

PREPARED BY: L. C. HANSON COMPANY
Consulting Engineers
3108 McHugh Lane
PO Box 299
Helena, MT 59624

Wally Koch, P.E.
Project Engineer

Robert Bovee
William F. Shaw, C.E.T.
Project Inspectors

L. C. HANSON COMPANY
CONSULTING ENGINEERS & SURVEYORS
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NORTH STAR MINE RECLAMATION

OBJECTIVE:

The project goal was to eliminate a public safety hazard and to return the surface area to a condition where it could be used for agricultural benefit.

PROJECT LOCATION:

The NORTH STAR MINE is located in Powder River County approximately 18 miles north of Broadus, Montana on U. S. Highway No. 312. More specifically the mine is in the N 1/2, SE 1/4, Section 21, T2S, R50E with the reclamation site situated approximately 500 feet of Highway 312.

PROJECT PLANNING:

L. C. Hanson Company provided engineering design, Contract administration, and resident inspection services on this project. Reclamation methods considered during preliminary engineering included blasting, hydraulic stowing, and gravity flush stowing. Gravity flush stowing was chosen as the means of backfilling the mine voids and preventing future collapse of the mine. Gravity flush stowing was chosen because of economics, a readily available source of water, ease of monitoring on-going reclamation results, and past success with gravity flush stowing procedures. The water for the flushing operation was obtained by dewatering the mine itself. Although easily obtainable, the water was of poor quality and not acceptable for agricultural use. Extensive study was done on the water system to insure an adaquate supply of water and also a method of disposing of excess water in such a manner as to not destroy the agricultural usefulness of the adjacent land.

The project was advertised and a Contract for construction was awarded to McDaniel and Sons Contractors of Neihart, Montana.

WORK DESCRIPTION:

Work began on July 9, 1984 and continued until November 30, 1984 at which time a Winter Shut Down was isssued. Work resumed on April 16, 1985 with work consisting of general cleanup, backfilling subsidence holes which developed during the winter shut down period, spreading topsoil, fertilizing, seeding, and mulching. All work was completed on April 30, 1985.

The work procedures which were performed to reclaim the NORTH STAR MINE site included the following:

1. A water supply, distribution, storage, and disposal system was installed. Two water wells were drilled and permanent submersible pumps installed. A pond was dug to provide storage for water needed for flooding and gravity flush stowing. The distribution and disposal systems allowed for water to either be discharged to the storage pond or to be disposed of down a natural drainage way.

2. Boreholes were drilled to determine the location and condition of the mine voids. The boreholes also served as a means to monitor the progress of the gravity flush stowing operations.

3. Water flooding of loosely consolidated soil and excavating to provide access to the mine voids.

4. Gravity flush stowing of material into the mine voids. The process consisted of dumping into a hopper material which was excavated from the site, mixing with high pressure water, and then flushing the slurry down into the mine void.

5. Backfilling of subsidence holes and regrading of the project site.

6. Revegetation of the entire project site.

QUANTITY SUMMARY:

Gravity Flush Stowage	16,500 C.Y.
Borehole Drilling	3,459 L.F.
Subsidence Backfill	6,100 C.Y.
Dewatering	6,350,000 Gallons
Total Area Reclaimed	8.6 Acres
TOTAL COST	$ 283,989.46
Cost Per Acre	$ 33,022.03

COMMENTS:

The gravity flush stowing operation required the use of the specially constructed hopper. Experimentation was required with the backfill material, water mixing, and size of flushing pipe to arrive at an acceptable production rate. Once the problems were worked out, the gravity flush stowing process worked well.

Flooding of subsidence holes produced some substantial accesses to the mine voids. Flooding was much more successful than high pressure water jetting in gaining access to the mine voids.

Although the project objectives were reached, the project was plagued by an antagonistic relationship between the Contractor, McDaniel and Sons Contractors, and the Engineer, L. C. Hanson Company. The project lacked the general give and take relationship between Contractor and Engineer that is needed in a construction project. Final quantities were also a point of contention. After lengthy negotiations, resolution of the quantities issue was reached with McDaniel and Sons agreeing to the quantities presented by L. C. Hanson Company.

- PHOTO SLIDE LOG -

NORTH STAR MINE

1.	7/10/84	Looking west - Recontour Area on right, Area 4 in center.
2.	7/10/84	Looking west at Recontour Area, access road and edge of Borrow Area in foreground.
3.	7/10/84	Looking north between Recontour Area and Borrow Area at buildings to be demolished - access road in foreground and east mine workings to right of large tree.
4.	7/10/84	Looking northwest across west edge Borrow Area and east mine workings at buildings to be demolished.
5.	7/10/84	Looking northwest at bare soil of Recontour Area.
6.	7/10/84	Looking northwest across Area No. 4 at bare soil of Recontour Area.
7.	7/10/84	Looking north across Area No. 4 and Recontour Area.
8.	7/12/84	Looking north at Borrow Area - south end is at painted pipe.
9.	7/12/84	Looking north-northwest between Borrow Area and Recontour Area - south end Borrow Area pipe at left edge.
10.	7/12/84	Looking east at east end earth dam.
11.	7/12/84	Looking northeast at Recontour Area - Area No. 4 at right.
12.	7/12/84	Looking northwest at west portion of Recontour Area from earth dam (road in foreground).
13.	7/12/84	Looking north at Storage Pit site and Recontour Area - office trailer to left of transformer pole.
14.	7/12/84	Looking northeast across Area No. 4, Recontour Area on left and Borrow Area in background.

15.	7/12/84	Looking north at westerly portion of Recontour Area.
16.	7/12/84	Looking east across Recontour Area and Area No. 4.
17.	7/12/84	Looking east across Recontour Area and Area No. 4.
18.	7/12/84	Northeast Area 1 opening with posted withdrawal notice from safety people.
19.	7/12/84	Northeast Area 1 opening.
20.	7/13/84	Looking southeast across north Area 3 subsidence at drill rig on Well No. 1.
21.	7/13/84	Looking northwest at drill rig at Well No. 1.
22.	7/13/84	Looking east across site from near Well No. 1.
23.	7/13/84	Looking south-southeast across Recontour Area and Area No. 4.
24.	7/13/84	Looking southwest across Recontour Area at earth dam.
25.	7/13/84	Looking east from northeast Area 1 opening across pond area.
26.	7/13/84	Looking east-northeast at building to be demolished (building has cistern).
27.	7/13/84	Looking southwest across pond.
28.		Looking east across pond - bank in back is part of mine area within Borrow Area.
29.	7/13/84	Looking south along west edge of Borrow Area.
30.	7/13/84	Looking south-southwest at ground in Borrow Area - north end Borrow Area stake at right.

31.	7/13/84	Looking south along mined area within Borrow Area from mound at north end.
32.	7/13/84	Rubble in subsidence at south end of mined area within Borrow Area.
33.	7/13/84	Looking north along mined area within Borrow Area.
34. thru 39.	4/17/85	Near access road and Highway #59 - looking north passing westerly. Panorama of site from east side to south side prior to work start-up.
40. thru 42.	4/29/85	Near power pole looking south passing east. Panorama of site from west to east after mulching.
43. thru 45.	4/30/85	Standing near location where 34 thru 39 were taken. Same series as 34 thru 39 taken at job completion.
46. and 47.	4/18/85	Near power pole - Subsided areas.
48. thru 50.	4/29/85	North of power pole near office site - Mulching operation in progress.